

The Effect of Dietary Supplementation of Onion and Garlic Husk Powder on Protein, Cholesterol and Fat of Duck Meat

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ABSTRACT

Onion and garlic husks contain antioxidant compounds such as allinin, allisin and flavonoid. The compounds are able to decrease fat and cholesterol levels in the body. This study was carried out to determine the effect of feeding onion husk powder (OHP) and garlic husk powder (GHP) on protein, cholesterol and fat content of Mojosari duck meat. The experiment was arranged in a completely randomized design (CRD) and used 168 birds of 4 weeks old male Mojosari ducks. The ducks were divided into 7 treatments and 4 replications (6 ducks each). The treatments were conducted for 4 weeks were as follows: T0 (control diet), T1 (control diet + 3% OHP), T2 (control diet + 6% OHP), T3 (control diet + 3% GHP), T4 (control diet + 6% GHP) and T5 (control diet + 1.5% OHP + 1.5% GHP) and T6 (control diet + 3% OHP + 3% GHP). The results showed that dietary OHP and GHP significantly increased protein and decreased cholesterol contents of duck meat, but no effect on meat fat. It could be concluded that the effect of feeding of OHP and GHP separately or in combination was able to increase protein and decrease cholesterol contents, but could not decrease fat content of Mojosari duck meat.

Key Words: Onion and Garlic Husks, Meat Protein, Cholesterol and Fat, Mojosari Duck

INTRODUCTION

In 2014, more than 36.9 tons of duck meats were consumed by Indonesian people, equal to 1.24% of the total national meat production (Ministry of Agriculture 2015). The problem of duck meat was high in fat and cholesterol contents which reached up to 13.8% and 75 mg, respectively (Dean 1978) compared with those of broiler meat which were about 4.97% and 52.44 mg, respectively for fat and cholesterol (Purwanti 2008). Fat and cholesterol are substances that can affect people's health such as caused coronary heart disease, obesity and hypertension if consume in excess amounts. Therefore, it is necessary to create innovations through feed manipulation to decrease fat and cholesterol contents of duck meat.

In recent years, the people have known the health benefits of garlic and onion compounds and made it to be a herbal product. In 2014, Indonesian onion production was 1.227.838 tons with an average growth production was 21.48% per year while the production of garlic in 2014 was about 16.902 tons with an average growth production was 7.21% per year (Ministry of Agriculture 2015). Garlic in one kilogram produced about 760 g of bulb and 240 g of husk (Qureshi et al. 1983). The husk may contain active substantial compounds such as polyphenol and flavonoid.

Onion (*Allium ascalonicum*) and garlic (*Allium sativum*) are herbal ingredients that contains the active substance to be able decrease fat and cholesterol. Both onion and garlic contain allinin and allisin, which are known to be hypolipidemic and other active substances such as flavonoid, quercetin, pectin allyl propyl disulfide (Jaelani 2007). Research of Kim et al. (2009) showed that additional 4% of garlic husk powder decreased more effective meat cholesterol than the similar percentage garlic bulb powder did in broiler chicken. Ao et al. (2011) stated that addition of fermented onion powder was able

to increase the quality of meat such as decreasing cholesterol level. Some studies above indicated the possibility of decreasing meat fat and cholesterol levels by supplementing onion husk powder (OHP) and garlic husk powder (GHP) in the duck ration.

This study was carried out to determine the effect of additional onion husk powder (OHP) and garlic husk powder (GHP) on fat, cholesterol and protein contents of duck meat.

MATERIAL AND METHODS

A total of 168 ducklings of 4 weeks old male Mojosari ducks with an average weight of 369 g were used for this study. They were fed diet composed of corn, soybean meal, rice bran and fish meal supplemented with OHP and GHP (Table 1). Onion and garlic husks were collected from traditional market in Semarang, Central Java, Indonesia. Onion and garlic husks were dried under sunlight and powdered by grinder (Kim et al. 2009). The ducks were housed in groups under open house system in 28-unit postal cages with 6 individuals per unit.

Table 1. Composition and nutritional content of the experimental diet

Feed stuff	T0	T1	T2	T3	T4	T5	T6
	-----%-----						
Corn	44.50	44.50	44.50	44.50	44.50	44.50	44.50
Soybean meal	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Fish meal	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Rice bran	19.20	19.20	19.20	19.20	19.20	19.20	19.20
CaCO ₃	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Premix	1.00	1.00	1.00	1.00	1.00	1.00	1.00
OHP	-	3.00	6.00	-	-	1.50	3.00
GHP	-	-	-	3.00	6.00	1.50	3.00
Total	100.00	103.00	106.00	103.00	106.00	103.00	106.00
Crude protein(%)	20.06	19.68	19.32	19.67	19.31	19.68	19.32
Ether extract (%)	2.95	2.94	2.93	2.93	2.90	2.94	2.92
Crude fiber (%)	4.45	5.31	6.12	5.30	6.09	5.30	6.11
Metabolizable energy (kcal/kg)	2902.00	2881.00	2861.00	2884.00	2867.00	2882.00	2864.00

The ducks were fed 3 times a day for 1 month of treatment with the amount of feed was based on the amount of feed consumed by the duck (Supriyadi 2011), their rearing duration was 30 days. Body weight was measured once a week. The experiment was designed to be completely randomized design (CRD) with 7 treatment groups and 4 replicates. Dietary treatments were as follows: T0 (control diet), T1 (control diet + 3% OHP), T2 (control diet + 6% OHP), T3 (control diet + 3% GHP), T4 (control diet + 6% GHP) and T5 (control diet + 1.5% OHP + 1.5% GHP) and T6 (control diet + 3% OHP + 3% GHP). At day 30, prior to slaughtering, the ducks were weighed, feed deprived for 6 h and then slaughtered in a commercial slaughterhouse. The carcasses were prepared by removing the skin, feet, reproductive organs, and digestive tract. Meat was collected 24 h postmortem from the carcass and immediately frozen at -20°C until analyzed.

The parameters measured were fat, cholesterol and protein contents of duck meat. Protein content of meat was analyzed by Kjehldal method, and fat content was measured used soxhlet extraction method and cholesterol content of meat was analyzed according to Liebermann – Burchard method (AOAC 1995). The data was subjected to ANOVA and continued to Duncan multiple test at $P < 0.05$ when the treatment indicated significant affect (Steel & Torrie 1994).

RESULTS AND DISCUSSION

Fat content of duck meat

Meat fat content was not significantly different (Table 2). It can be assumed that the active compounds of garlic had more affect than onion did. According to Rofiq (2003), that high fiber could reduce fat level. Onion and garlic husks had a high crude fiber content about 33.85% and 33.41% respectively. Slightly decreasing level of fat, it could also decrease the cholesterol level. The amount of feed intake would affect the growth of high fat and consequently ended up with high accumulation of cholesterol in meat.

The formation of body fat in duck was due to an excess of energy consumed. According to the North & Bell (1990) energy from feed stuff was used by animal for maintenance, growth (including fats) and production. Syukron (2006) stated that the high amount of diet caused the increase fat meat. The high amount of feeding crude fiber, led to decrease meat fat content, because more energy was needed to digest feed crude fiber, consequently there was no storage of excess energy.

Table 2. Protein, fat and cholesterol meat of 8-weeks old Mojosari duck

Variable	Treatment						
	T0	T1	T2	T3	T4	T5	T6
Meat fat (%)	23.21 ^{ns}	22.19 ^{ns}	22.71 ^{ns}	21.56 ^{ns}	22.56 ^{ns}	22.85 ^{ns}	21.23 ^{ns}
Meat cholesterol (mg/100 g)	45.67 ^a	32.61 ^c	28.65 ^d	28.60 ^d	37.42 ^b	38.98 ^b	28.59 ^d
Meat protein (%)	19.88 ^d	21.52 ^{abc}	20.51 ^{cd}	20.81 ^{bcd}	21.13 ^{abcd}	21.94 ^{ab}	22.52 ^a

- ns: non significant

- Different small letters indicate significant difference at 5% levels in the same row

Cholesterol content of duck meat

Meat cholesterol was significantly affected by treatments (Table 2). Control diet produced the highest cholesterol meat content but T6 was the lowest similar to those of T2 and T3 (Table 2). However, T1, T4 and T5 were medium level although among them were significant. This was because of the onion and garlic husks had antioxidants content such as allicin, polyphenols and flavonoid. Antioxidant activity of OHP was about 50.43 ppm and GHP was about 1754.88 ppm respectively. The antioxidant activity can increase the production and secretion of bile therefore could aid to breakdown of fat and decrease cholesterol synthesis, because more bile was secreted, more cholesterol was used in the production of bile. The present result was in accordance the finding of Kim et al. (2009) that the garlic powder and garlic extract have shown antioxidant activity in different types of poultry meat. The production of bile will be secreted and used for fat metabolism. A product of the fat metabolism was in the form of bile acids and these bile salts were

reabsorbed while the results in the form of cholesterol wasted in excreta. Thereby, it could decrease cholesterol level. Sujana et al. (2007) reported that the reduction of cholesterol meat occurs as a result of blood cholesterol in the body was widely used to synthesize bile. Gong-chen et al. (2014) stated that cholesterol absorption in the small intestine could be inhibited by saponin (component in allicin), saponin might also reduce plasma cholesterol level.

In addition to antioxidant content in the onion and garlic husks, the fiber content also capable to decrease cholesterol in the body of duck. Fibers are being mediator to increase bile acids excretion to decrease cholesterol. The mechanism of cholesterol synthesis suppression induced by dietary crude fiber was to increase intestinal peristaltic caused feed was not absorbed optimally. This phenomenon decrease basic compounds as precursor of cholesterol in blood vessel and tissue also reproduce lost bile salts in the duodenum so that hearts need more cholesterol to produce bile salts by taking up cholesterol in the tissue (Astuti 2004). According to Devlin et al. (1993) cholesterol was part of a fat. If the amount of fat content in the body was low, the cholesterol would be as low as fat content. This was consistent with the results of present study that the lowest fat and cholesterol duck meat levels was found in T3 and T6.

Protein content of duck meat

Meat protein was significantly affected by treatments (Table 2). Control diet caused the lowest content of meat protein but T6 was the highest. According to Hartono et al. (2013) stated that fat content has a negative correlation with protein content, slightly increasing the protein duck meat content, it can also decrease the fat content of meat. This was evident from this research data that meat with high protein content and low fat content found on T6.

Antioxidant content in onion and garlic can act as an antibacterial that can improve the health of the digestive system therefore absorption of nutrients diet will be increased. One indication of good absorption of nutrient is the result of protein digestibility. Protein digestibility values were not significantly different. The value of protein digestibility although statistically was not different, T6 and T4, numerically were slightly higher than the others (Yoseph unpublished). The high amount of protein digestibility caused the amount of nitrogen that enters to the body increased, so that the process of protein synthesis increased and produced high protein content of meat. Winedar et al. (2004) stated that one factor that affected the chemical composition of meat was good feed absorption; it needed to be supported by digestive enzymes to remodel a feed nutrient into smaller molecules that could facilitate absorption and therefore affected growth. The content of onion husk was also able to inhibit the growth of bacteria (*Escherichia coli*, *Pseudomonas fluorescens* and *Bacillus cereus*) and fungi (*Aspergillus niger*, *Trichoderma viride* and *Penicillium cyclopium*) (Skerget et al. 2009).

CONCLUSION

Feeding onion and garlic husks powder separately or in a combination was able to decrease cholesterol meat content and increased protein meat content but no effect on fat content of Mojosaari male duck meat.

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